

WHAT IS CLAIMED IS:

1. A mounting angle detection device for detecting a mounting angle of a vehicle-mounted device mounted in a vehicle,

5 comprising:

an acceleration sensor mounted in the vehicle-mounted device; and

a mounting angle processor,

10 wherein the mounting angle processor determines a sine value of a mounting angle in a pitch direction of the vehicle-mounted device by dividing a totalized and averaged value by acceleration of gravity, the totalized and averaged value being determined by totalizing and averaging acceleration detected by the acceleration sensor.

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2. A mounting angle detection device for detecting a mounting angle of a vehicle-mounted device mounted in a vehicle, comprising:

20 an acceleration sensor and a GPS receiver mounted in the vehicle-mounted device; and

a mounting angle processor,

wherein the mounting angle processor includes:

25 a pitch angle processor for determining a sine value of a mounting angle in a pitch direction of the vehicle-mounted device by dividing a totalized and averaged value by acceleration of gravity, the totalized and averaged value being determined by totalizing and averaging acceleration detected by the

acceleration sensor; and

5 a yaw angle processor for determining a cosine value of a mounting angle in a yaw direction of the vehicle-mounted device by subtracting a product of the acceleration of gravity and the sine value of the mounting angle in the pitch direction from acceleration detected by the acceleration sensor to determine a subtracted value, and then dividing the subtracted value by a value determined by multiplying reference acceleration obtained from the GPS receiver or from a vehicle speed pulse sensor by a cosine value of the mounting angle in the pitch direction.

3. A mounting angle detection device for detecting a mounting angle of a vehicle-mounted device mounted in a vehicle, comprising:

15 an acceleration sensor, a GPS receiver and a gyroscopic sensor mounted in the vehicle-mounted device; and

a mounting angle processor,

wherein the mounting angle processor includes:

20 a pitch angle processor for determining a sine value of a mounting angle in a pitch direction of the vehicle-mounted device by dividing a totalized and averaged value by acceleration of gravity, the totalized and averaged value being determined by totalizing and averaging acceleration detected by the acceleration sensor;

25 a sensitivity detector for determining a ratio of angular velocity detected by the gyroscopic sensor to reference angular

velocity obtained from the GPS receiver as sensitivity of the gyroscopic sensor; and

a roll angle processor for determining a cosine value of a mounting angle in a roll direction of the vehicle-mounted device
5 by dividing the determined sensitivity of the gyroscopic sensor by a cosine value of the mounting angle in the pitch direction.

4. The device according to any one of claims 1-3, further comprising a comparator for comparing the value corresponding
10 to the mounting angle detected by the mounting angle processor to a permissible range concerning the mounting angle and then determining that the mounting angle of the vehicle-mounted device is abnormal when the mounting angle is over the permissible range.

15 5. The device according to any one of claims 1-3, further comprising a comparator for comparing the value corresponding to the mounting angle determined by the mounting angle processor to a value corresponding to a mounting angle determined last time by the mounting angle processor and then determining that
20 the mounting angle of the vehicle-mounted device has been changed when the value corresponding to the mounting angle determined by the mounting angle processor differs from the value corresponding to the mounting angle determined last time.

25 6. The device according to claim 4, further comprising notifying means for notifying that the mounting angle is abnormal when the comparator determines the abnormality.

7. The device according to claim 5, further comprising
updating means for resetting operation of the vehicle-mounted
device when the comparator determines that the mounting angle
5 has been changed.

8. A mounting angle detecting device for a vehicle-mounted
device, comprising:

a sensitivity detector for determining a ratio of angular
10 velocity detected by a gyroscopic sensor mounted in the
vehicle-mounted device to reference angular velocity obtained
from a GPS receiver mounted in the vehicle-mounted device as
sensitivity of the gyroscopic sensor; and

a comparator for comparing the sensitivity of the
15 gyroscopic sensor determined by the sensitivity detector to a
permissible range concerning the sensitivity and then
determining that the mounting angle of the vehicle-mounted device
is abnormal when the sensitivity is over the permissible range.

20 9. A mounting angle detecting device for a vehicle-mounted
device, comprising:

a sensitivity detector for determining a ratio of angular
velocity detected by a gyroscopic sensor mounted in a
vehicle-mounted device to reference angular velocity obtained
25 from a GPS receiver mounted in the vehicle-mounted device as
sensitivity of the gyroscopic sensor; and

a comparator for comparing the sensitivity determined by

the sensitivity detector to sensitivity determined last time by the sensitivity detector and then determining that the mounting angle of the vehicle-mounted device has been changed when the sensitivity determined by the sensitivity detector
5 differs from the sensitivity determined last time.

10. The device according to claim 8, further comprising notifying means for notifying that the mounting angle is abnormal when the comparator determines the abnormality.

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11. The device according to claim 9, further comprising updating means for resetting operation of the vehicle-mounted device when the comparator determines that the mounting angle has been changed.